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## MEASURES APPLICABLE TO NURSES IN THE PREVENTION OF CONTAGIOUS DISEASES<sup>1</sup>

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We shall limit this paper to the consideration of some measures which are effective in protecting attendants from the contagious diseases of their patients. Among the contagious diseases we now place not only the eruptive diseases and diphtheria, but also pneumonia, epidemic meningitis, and acute poliomyelitis. Doubtless our epidemics of "colds" and "grippe" are spread by contact. To consider our problem intelligently it is essential to have a clear idea as to how the diseases in question pass from one person to others. In most instances the material which carries the contagious principal is secretion from the lungs, bronchi, throat, mouth and nose. It is by the passage of this material, containing the specific agent, from the sick to the well that the disease is transferred. Usually the infecting substance must enter through the nose or mouth, either lodging and multiplying upon the local mucous membrane or being swallowed. In some instances secretions may escape from the sick person, become dried and pulverized, and in the form of dust be inhaled by healthy persons. Most disease germs do not withstand this process of drying, especially if exposed to sunlight, but a few escape and may be able to cause infection when inhaled. The role played by dust as the vehicle of infectious agents is now considered a small one compared with that occupied by fresh moist materials.

In some instances the moist secretions are forcibly driven in the form of minute droplets through the air from the sick to the well. This is accomplished by coughing, sneezing, laughing, spitting, etc., and naturally can succeed only over short distances, as from two to three feet. This is the way in which nurses and attendants are occasionally infected while caring for the mouths and throats of patients and this was the frequent method of transferring diphtheria to doctors and nurses in pre-antitoxin days when local measures of treatment, such as swabbing, etc., were relied upon. By this means various infections are spread when persons are crowded closely together, as in street cars, elevators, etc.

Often moist infectious material is transferred by direct contact, as in kissing, or is taken up and carried mechanically by some inter-

<sup>1</sup>Read before the medical staff and nurses of Evanston Hospital, February 20, 1918.

mediary agent. These intermediary carriers comprise a great variety of objects, such as eating and drinking utensils, pencils, toys, hands, pet animals, etc.

There is still another method by which infections are spread, in which the infectious materials do not pass directly from the sick to the well, but find conditions outside the body in which they live and even multiply and eventually again give rise to disease in susceptible individuals. This growth outside the body may occur in certain foods which are eaten uncooked, such as milk, oysters, etc. Such contaminated foods give rise to extensive outbreaks of certain infectious diseases such as typhoid fever, and septic sore throat.

In recent times we have heard much of "carriers" in connection with the spread of infectious diseases. These carriers are persons who harbor disease-producing bacteria, usually upon certain mucous surfaces, but are not affected by them. An example of a carrier is a person who has recovered from diphtheria and who is immune to the disease, but who, for a long time, has diphtheria bacilli upon his tonsils. The bacilli in this case are essentially outside the body and continue to live and multiply in the secretions upon the surface of the mucous membrane. From such an individual the disease may spread as from a person sick with the disease. Persons who are closely associated with cases of contagious disease, although immune themselves, may become carriers. This often is true of cases of diphtheria, and apparently also of those closely associated with epidemic meningitis and pneumonia. There is much reason for believing that carriers play a considerable part in the dissemination of these.

To summarize, contagious diseases are spread through the secretions from the diseased person, which hold the specific agent causing the disease. These secretions are transmitted from the sick to the well: 1.—In dust by inhalation; 2.—In a moist state, A—In droplets through the air, B—By direct or indirect contact; 3.—After growth outside the sick person, A. In foods, B. By Carriers.

Coming now to the measures to be used in protecting from infection those who care for cases of contagious diseases, we find that they embody the practical application of our knowledge of the means by which these diseases are spread.

Until recent years the principal protection of a nurse against contagious diseases was her personal immunity, either natural, or acquired from former attacks of disease. It was even urged that only those who had passed through an attack of scarlet fever or who were over thirty years of age should be allowed to nurse persons sick with this disease. With intelligent use of all the protective measures now

available there is no more, and apparently there is less, likelihood of a nurse contracting contagious diseases when caring for patients sick with them, than when doing general hospital nursing. The nurses sick with scarlet fever who are treated in Durand Hospital come from various general hospitals but have rarely been taking care of recognized cases of the disease. We go so far as to tell our nurses that, barring accidents, if they contract scarlet fever or diphtheria they are themselves to blame through faulty technique.

The first line of defense against infection and the one most proof against accident is a condition of individual immunity. This may be natural or acquired. It is well known that some persons never contract certain diseases, however much exposed. They are naturally immune. Immunity of a permanent character follows an attack of the contagious diseases in almost all instances. This is acquired immunity. We are able to produce immunity against certain diseases through vaccination. The best known is vaccination against small-pox. This furnishes a perfect protection and only ignorance has prevented the complete eradication of the disease. Of course, all nurses should be protected by vaccination against small-pox. More recently, vaccinations against typhoid and paratyphoid fever have been perfected and through their use these scourges of army camps have been eliminated. This protection should also be given to nurses who have to do with the care of sick people.

Protection against diphtheria may also be secured either immediately, by injection of antitoxin, or after an interval through diphtheria vaccine. In the Durand Hospital we had nine cases of diphtheria among sixty-nine nurses during twenty months, i. e., 13 per cent. We then began applying the Schick test to all nurses and to those who proved to be susceptible to diphtheria, we gave an immunizing dose of antitoxin. This was repeated every three or four weeks. During the three years since instituting this procedure only three very mild cases of diphtheria have developed among 116 nurses, i. e., 2.6 per cent. Two of these were due to neglect in retesting nurses who were very near the end of their service.

The diphtheria vaccine, or toxin-antitoxin mixture, is not applicable to our circumstances as the immunity often requires several weeks to develop. In conditions where the testing and immunizing could be done some weeks in advance of taking contagious service, the systematic use of the toxin-antitoxin mixture to immunize all who give positive Schick reactions would be the ideal method to follow. The immunity produced in this way often lasts a long time, usually for several years and sometimes for life.

These specific means of defense are applicable to only a few dis-

eases. In all other cases we must depend on measures designed to prevent the transfer of infectious material from patients. All secretions should be collected and destroyed. None should be allowed to become dry and capable of dissemination in dust. The clothing should be covered by a suitable gown and the hair completely covered by a linen cap. The most important single item in the conduct of nurses and attendants is the careful and thorough cleansing of the hands with soap and warm water whenever a patient has been handled, and always on going from one patient to another. While on duty the hands should never be put to the face or hair. Thorough cleanliness by means of soap and water has entirely replaced the use of antiseptic solutions for the hands in our hospital; in fact, antiseptic agents are rarely used for any purpose and fumigations are never employed, except for some articles of clothing which cannot be sterilized by steam. Perfect individual technique would not allow any infectious material to be carried from the patient to the mouth or nose of the attendant.

Nurses may become carriers of disease germs, especially of diphtheria bacilli, even when they are immune to diphtheria. They thus become active agents in spreading diphtheria bacilli although never sick. In Durand Hospital, during nineteen months we had ten carriers among forty-three nurses, i. e., 23.25 per cent. During the following eighteen months, gauze masks were worn by the nurses when caring for cases of active diphtheria, and but six carriers have appeared among seventy-three nurses, i. e., 8.2 per cent. During twenty-seven months, nine cases of scarlet fever developed among 112 nurses, while after face masks were systematically worn, no cases of scarlet fever have appeared among seventy-three nurses during eighteen months. Since the masks have been worn there have also been fewer cases of tonsillitis, rhinitis, etc. The masks consist of a double layer of gauze, so shaped as to cover the mouth and nose, and secured by two tapes behind the head. We have found by experiment that the double layer of gauze will filter out most of the bacteria thrown into the air by patients in coughing. We believe the mask is a valuable protection and advocate its being worn in caring for patients with much secretion, especially in persons who cough. It should be very useful to those caring for cases of pneumonia, epidemic meningitis and pulmonary tuberculosis, as well as the usually recognized contagious diseases. The mask not only helps to protect the attendant from contracting disease, but also prevents the production of carriers who are probably of much more importance as spreaders of infections than we have realized, especially in diphtheria, meningitis and pneumonia.